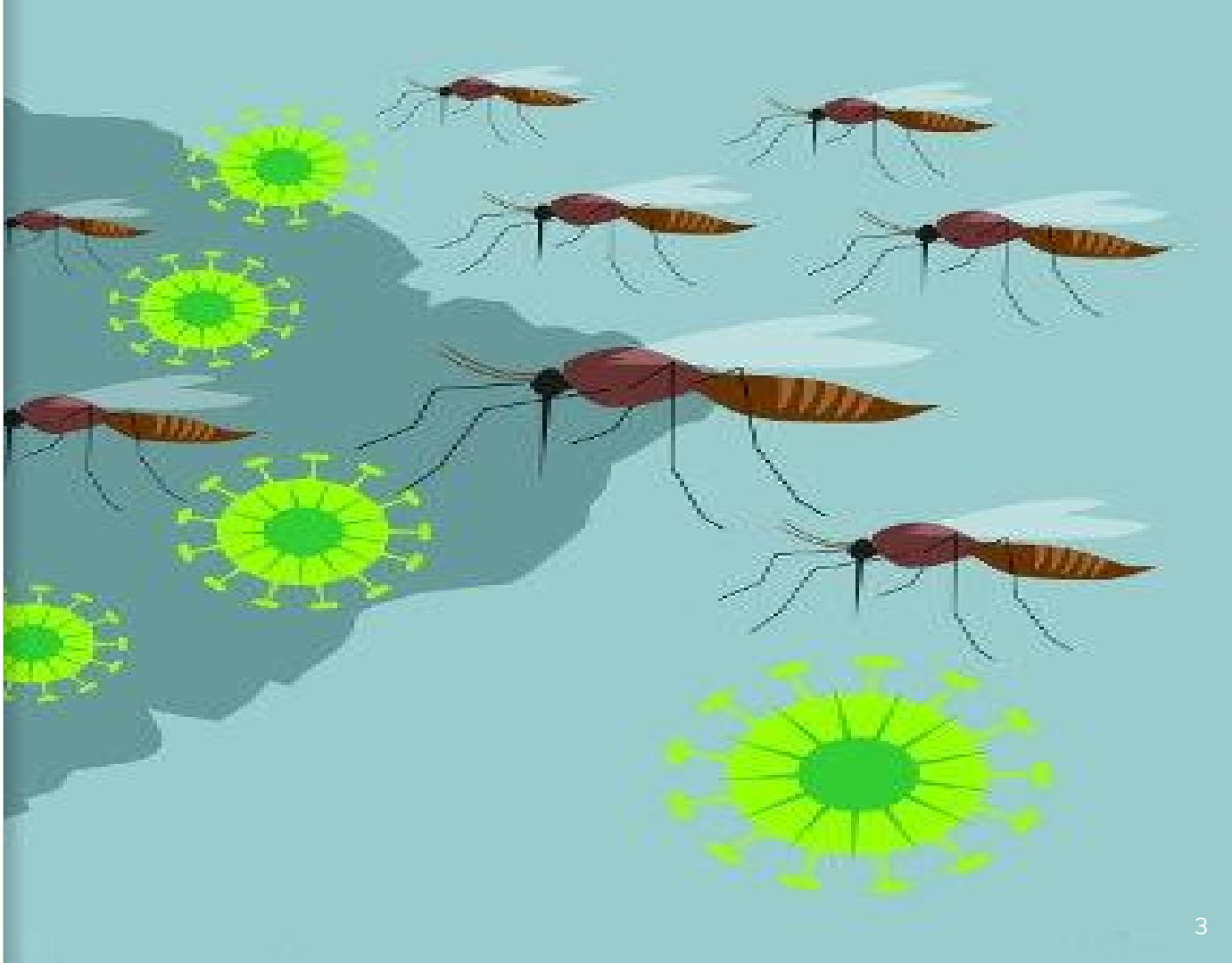
Método de classificação de mosquitos usando Redes Neurais Convolucionais

Sumário

1.

Introdução

Dengue : Um grande problema no Brasil

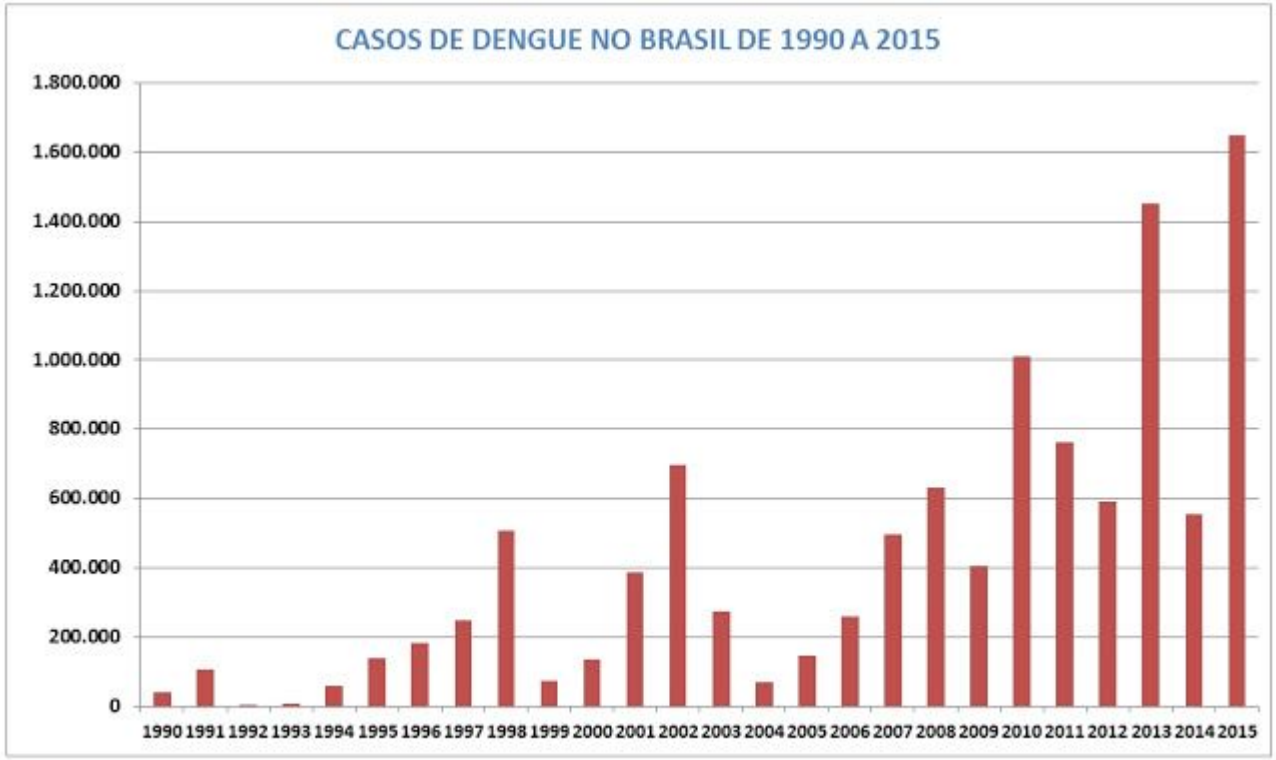


Introdução

- Vários casos de contaminações por dengue registrados no Brasil, cerca de 1.600.000 em 2015 *
- Doenças graves advindas do contato com o mosquito (Dengue, Zika entre outras).
- Fácil proliferação do mosquito .

** Fonte : portalsaude.saude.gov.br*

Introdução



FONTE: http://portalsaude.saude.gov.br/

Problematização

Casos

Estudos recentes mostram que os casos de dengue não param de diminuir.

Gastos

Gastos com saúde, prevenção e tratamento de doentes e infectados.

Crianças

Alto fator prejudicial às crianças recém nascidos.

Localidade

O mosquito vetor possui uma grande facilidade de se reproduzir e se alastrar.

Recipientes

Dificuldade de retirar recipientes que armazenam água da chuva.

Trabalhos Relacionados

Para os trabalhos relacionados, foi escolhido 5 trabalhos mais relevantes encontrados na literaturas com o contexto na problemática apresentada

Indentificação de mosquito

Trabalhos que utilizaram abordagens para identificação de mosquitos.

Redes Neurais

Trabalhos que utilizaram técnicas de redes neurais, focado no contexto biológico de insetos.

Trabalho 1 - 2014

Autores fizeram caracterização de alguns insetos e análise estatística dos dados. As características utilizadas foram abdomen, tórax, cabeça entre outros. As imagens foram filtradas e realizado segmentação para a classificação.

TELKOMNIKA Indonesian Journal of Electrical Engineering
Vol.12, No.7, July 2014, pp. 5368 ~ 5378
DOI: 10.11591/telkomnika.v12i7.5281

Characteristics Analysis and Detection Algorithm of Mosquitoes

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Abstract

The systematic detection and elimination of mosquitoes is a valuable process, the results of which could be important in the fight against Malaria. In this study, image processing is used, allowing the researchers to detect the mosquitoes and their locations. Mosquitoes' physical characteristics, territorial and behavioral patterns were also analyzed through recognition technology. It is found that mosquitoes can be detected and differentiated by their physical, territorial and behavioral patterns through these methodologies. In addition to mosquitoes, flies and bees are also included in this study and were analyzed for their patterns, as well as their distinguishing features. Size, number of objects, proboscis, body shape, color, antennae, hind legs, and shape parameters were all factors considered for mosquito detection with image processing. All these informations were used in the Mosquito Detection Algorithm. This study provides characteristic descriptions of all three insects and statistical analysis of the data found.

Keywords: *mosquito, pattern, mosquito model, detection, malaria*

1. Introduction

Human Malaria and some other diseases such as yellow fever and dengue are transmitted by mosquitoes [1]. Particularly, the female mosquitoes are dangerous vectors for infesting humans with such diseases. Malaria transmission can be experienced in houses, forests, farms and any other vector disease environment. There are some mosquitoes which bite humans routinely. These routine bites with vectors carrying infectious diseases affect millions of people per year [2, 3]. Although there are others mosquitoes which do not bite humans, they are nonetheless vectors for animal diseases such as dengue, Zoonosis, etc. [4, 5]. Every year about one million people lose their lives due to Malaria caused mainly by Mosquitoes. Among this figure, about 85% are Children under the age of 5 years old [4]. Most Malaria cases that result in the loss of life occur in developing countries with 90% of malaria

Trabalho 2 - 2009

Os autores propuseram um novo algoritmo para segmentação e contagens de ovos do mosquito . O artigo utiliza uma nova versão do k-means com algumas técnicas de processamento de imagem, onde o mesmo converteu a imagem para HSV seguido de algumas extrações de features.

31st Annual International Conference of the IEEE EMBS
Minneapolis, Minnesota, USA, September 2-6, 2009

A New Algorithm for Segmenting and Counting *Aedes aegypti* Eggs in Ovitraps

G. Gusmão, Saulo C. S. Machado, and Marco A. B. Rodrigues

***Abstract*—Dengue fever has become a major international public health concern in recent decades. As dengue fever not have available vaccine or specific treatment, the only known form to prevent the illness is by applying strategies to control its vector, the *Aedes aegypti* mosquito. Ovitraps, special traps to collect mosquito eggs, are used to detect *Aedes aegypti* presence and to approximate the gauge of the adult mosquitoes population in the environment by counting the number of eggs laid in an trap. This counting is usually performed in a manual, visual and non-automatic form. This work proposes a new automatic method to automatically count the number of eggs in digital images of ovitraps based on image processing techniques (color systems exploration) and k-Means clustering algorithm. The proposed method performs an improvement on the results when compared with previous studies.**

I. Introduction

DENGUE fever is currently the most globally widespread insect-born virus infection, causing 50 - 100 million cases per year in more than 100 endemic countries. Dengue fever is found in tropical and sub-tropical regions around the world, predominantly in urban and semi-urban areas. Dengue virus is transmitted to humans mainly by *Aedes aegypti* mosquito, which is also vector of yellow fever.

The first historic case of dengue fever in the world was recognized in Java Island in 1779. In Americas, the disease was related over 200 years ago, with epidemics in Caribbean and United States. In 1982, the first Brazilian epidemic was

As dengue fever does not have available vaccine or specific treatment yet, the only form to prevent the illness is to apply strategies of vector control which demand that areas of risk and periods of risk are identified [3]. Entomological surveillance is used to indicate priority areas to allow stratification of control measures and to help the decision of which control strategies will be used at a certain time. The primary purpose, however, should be to identify areas and periods of time when it is most probable dengue fever occurrence [4].

Dengue vector surveillance is classically based on the Premise Index and the Breteau Index, both of which use visual detection of larvae in domestic containers. *Aedes aegypti* larvae visualization is an inaccurate technique because of the larvae's ability to escape rapidly and their capacity to remain submerged for long periods of time. The percentage of premises or containers where *Aedes aegypti* larvae are found does not provide information regarding the mosquito population density (registering as positive a container whether just one or thousands larvae are present,). These indices do not seem to be an adequate way of meeting vector surveillance needs [5].

Ovitrap surveys could be considered an effective and efficient technique for detecting and monitoring *Aedes aegypti* populations at low densities [6]. Using ovitraps for vector surveillance seems to be a current trend in dengue endemic countries, since this method is more sensitive and it

Trabalho 3 - 2017

Os autores propuseram um novo método baseado em redes neurais convolucionais para detecção de larvas de mosquitos. Este artigo utiliza a arquitetura Alexnet para a aprendizagem profunda, onde o dataset foi obtido pelos próprios autores.

Mosquito Larva Classification Method Based on Convolutional Neural Networks

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***Abstract*—In Mexico a great number of diseases spread by the mosquitos *Aedes* has been reported. There are some regions on the country that this number is alarming. The spread of this disease becomes a public health problem and the government is worried about this situation and applied some methods for reducing the infection rate. One of principal methods relies on the localization of the mosquito's larvae and then fumigates them. The localization of *Aedes* larvae is accomplished through state programs which take a considerable time, making them not efficient enough. In this paper we propose a novel method based on convolutional neural networks, where a dataset of larva is used in training in order that the machine learns two types of mosquitos, genus *Aedes* and "others" genera. The digital images of larva are processed using a set of machine learning algorithms and as a result, the classification task is done. The proposed method would make the larva identification process more efficient, automatic and faster than the conventional methods, and thus the infection rates would be decrease. The results show a good performance on *Aedes* larva identification, proving that the system can be applied in the real world.**

Keywords—larva; mosquito; classification; convolutional neural networks; Aedes.

I. Introduction

Recently several diseases such as Dengue Fever (DF),

Fig. 1 The *Aedes Aegypti* mosquito. One of its particularities is the presence of white spots in the body [4].

Almost all these diseases are observed mainly in the tropical zone of Mexico, such as Chiapas, Morelos, Veracruz, Oaxaca, etc, because *Aedes* mosquitos are very common in these areas. However, due to the global climate change in the earth, these types of mosquitos have been observed in non-tropical zone, such as Mexico City.

Trabalho 4 - 2017

Os autores usaram um classificador SVM para classificação, onde as features usada foram cor e morfologia. A segmentação de imagens foi utilizada para separar o mosquito do background, onde foi utilizado um filtro de sobel para detecção de borda. Os autores não consideram elementos como asa e braços, pois os mesmos foram retirados no processo de segmentação.

applied sciences

MDPI

Article

Vision-Based Perception and Classification of Mosquitoes Using Support Vector Machine

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Academic Editor: Antonio Fernández-Caballero
Received: 3 October 2016; Accepted: 27 December 2016; Published: 5 January 2017

Abstract: The need for a novel automated mosquito perception and classification method is becoming increasingly essential in recent years, with steeply increasing number of mosquito-borne diseases and associated casualties. There exist remote sensing and GIS-based methods for mapping potential mosquito inhabitants and locations that are prone to mosquito-borne diseases, but these methods generally do not account for species-wise identification of mosquitoes in closed-perimeter regions. Traditional methods for mosquito classification involve highly manual processes requiring tedious sample collection and supervised laboratory analysis. In this research work, we present the design

Trabalho 5 - 2017

Para este artigo foi utilizado uma árvore de decisão, onde o principal objetivo e identificar mosquitos fêmeas. Eles usaram como pré processamento transformação em escala de cinza, borramento e equalização de histograma .

MAT JOURNALS

International Journal of Imaging Science and Pattern Recognition
Volume 1 Issue 1

Computer Vision Based Identification of Dengue Mosquitoes from Images

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Abstract

The proposed work detects and identifies the Dengue mosquito from the images based on its descriptor values. Dengue mosquito is a carrier of dengue virus which causes the hemorrhagic fever. The image is identified as dengue or normal mosquito image. Further, the dengue mosquito image is identified for a male dengue mosquito or female dengue mosquito. The descriptor values of size, stripes on legs, slender body and color are extracted. The accuracy of identification of mosquito and other insects is found to be 98%. The accuracy of identification of dengue mosquito and other mosquito is found to be 97%. Similarly, accuracy of male and female mosquitoes is found to be 98.5%.

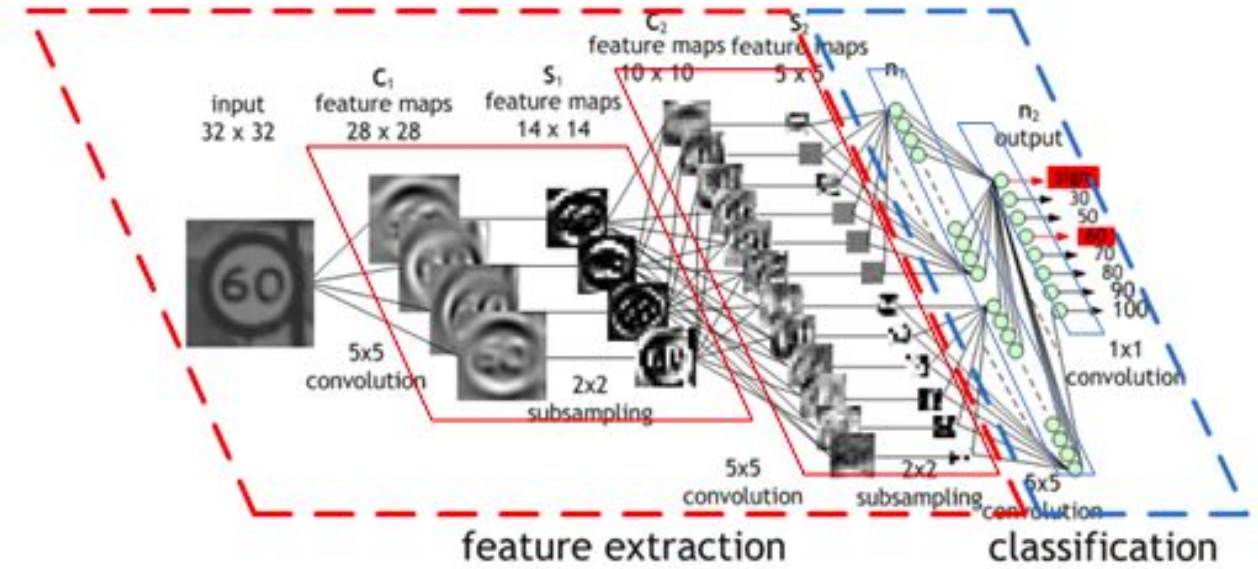
INTRODUCTION

Computer vision could be a field that has ways for effort, processing, analyzing, and understanding pictures and normally, high-dimensional knowledge from the $64000 world so as to provide numerical or symbolic data. The Indian Council of Medical Research the apex body in India for the formulation, coordination and promotion of biomedical research, is one of the oldest and largest medical

which the result could be important to fight against malaria, yet the study does not determine if the detected mosquito is an AedesAegypti which is a dengue carrier mosquito. In order to prevent the infection caused by dengue virus, different techniques to detect mosquitoes have been developed by Jahangir, Monnette Vessel and many others. To classify the various species of mosquitoes, different parameters such as size, shape, color,

Proposta

Utilização de tecnicas de deep learning - CNN



Redes Neurais

- Técnica de classificação supervisionada
- Construída com várias camadas agrupadas

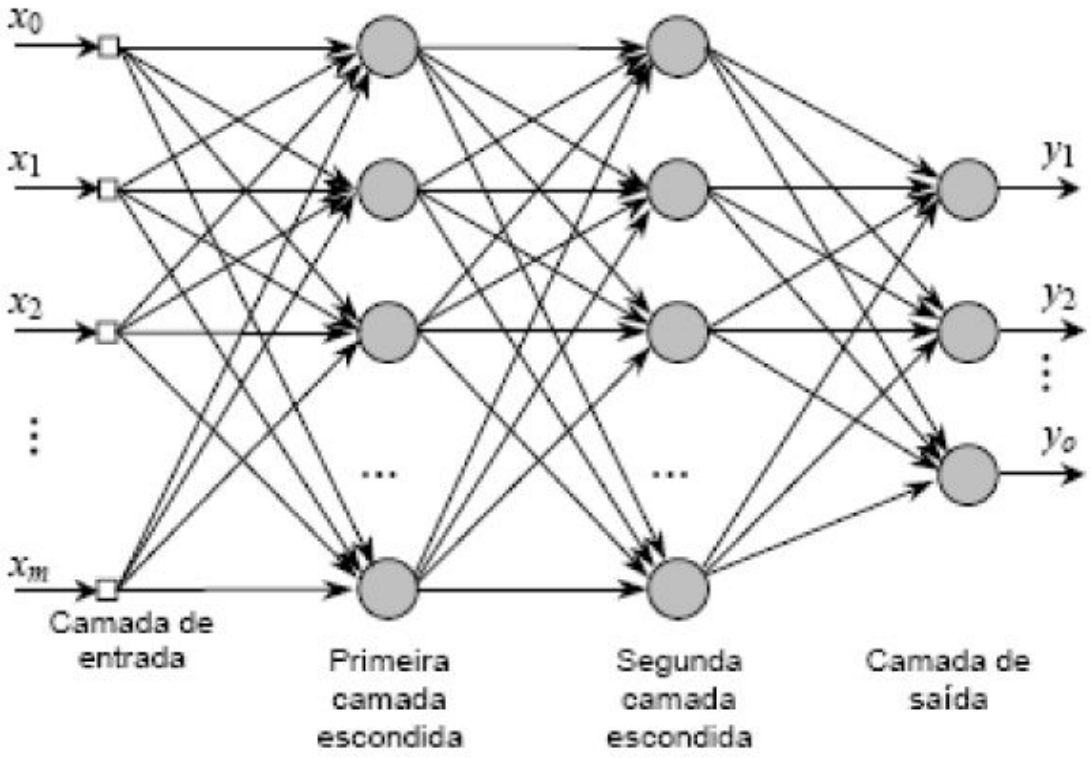
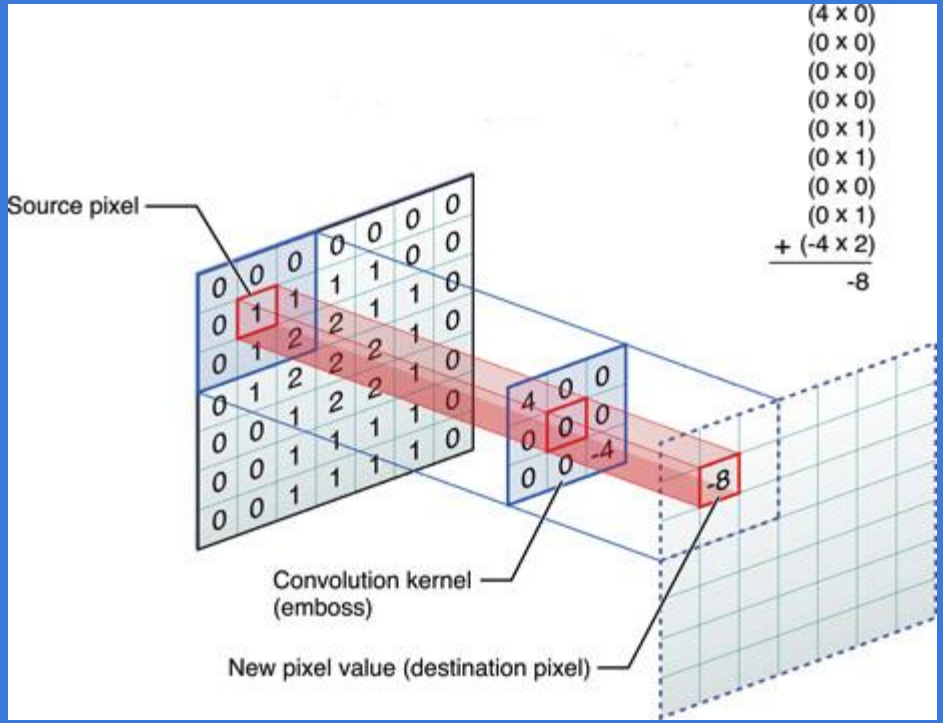


Figura 1 – Rede Neural Artificial Multicamadas.

Camada Convolutiva

- Camada que é responsável pela extração das features da imagem

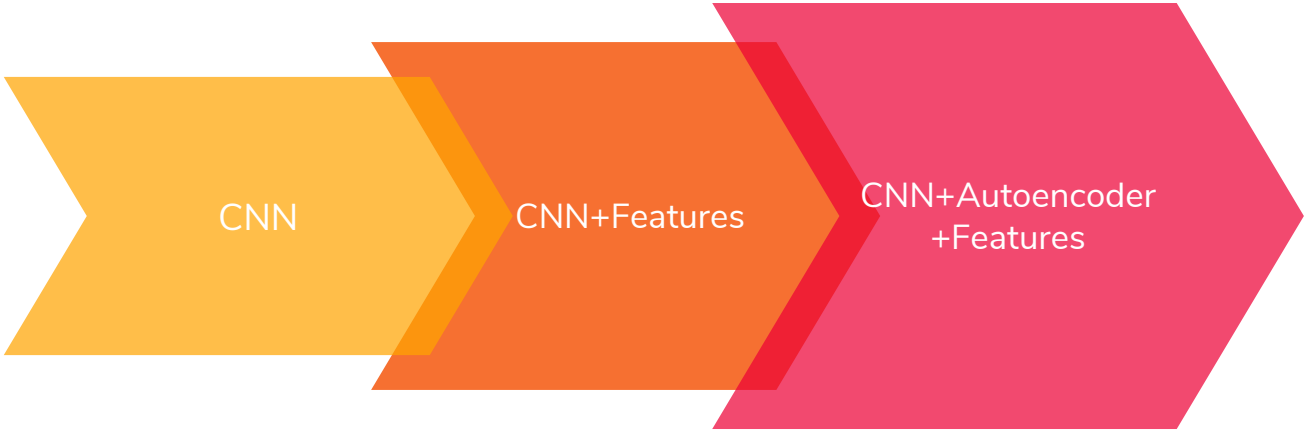


Proposta

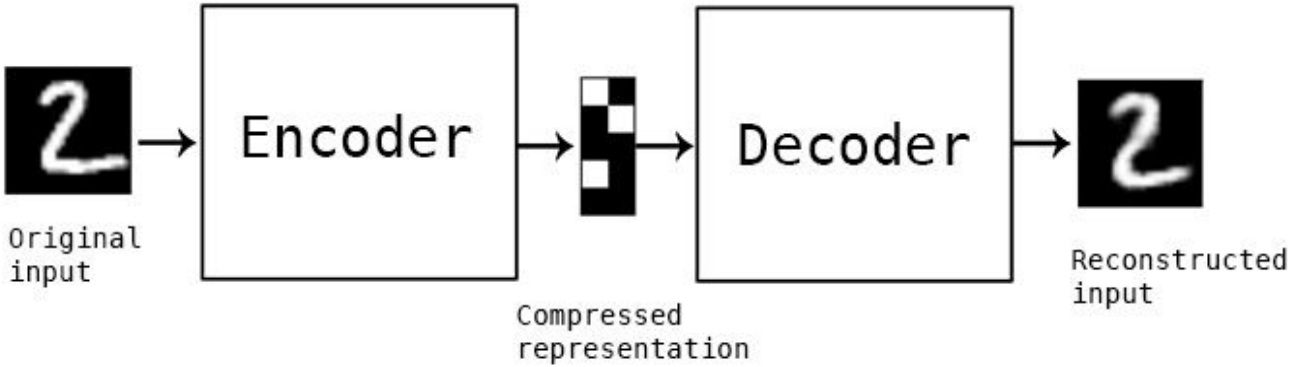
Com redes neurais convolucionais, evitamos a etapa de extração de features e com isso, podemos utilizar a imagem para realizar a classificação

- Treinamento do modelo - (1 Semana)
- Classificação (Avaliação, matriz de confusão e resultados gerais) - (1 Semana)
- Comparação com os métodos apresentados anteriormente - (2 Semanas)

Plano de ataque



Plano de ataque



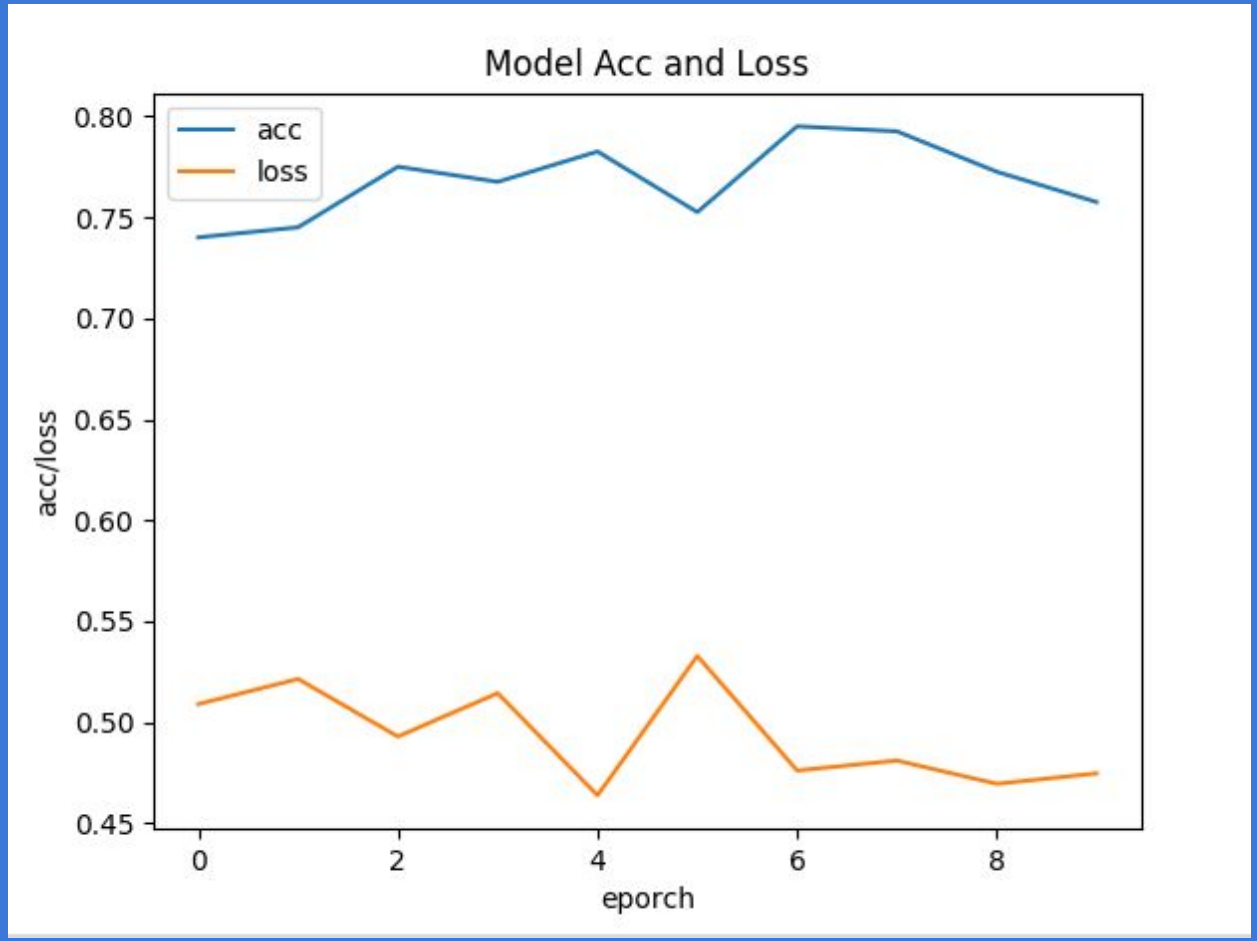
Expectativas

- Modelo preliminar

```
>>> model = zika_model(input_shape)
>>> model.summary(0
... )
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
batch_normalization_9 (Batch (None, 3, 300, 300)       1200
_________________________________________________________________
conv2d_25 (Conv2D)           (None, 32, 300, 300)      896
_________________________________________________________________
conv2d_26 (Conv2D)           (None, 32, 298, 298)      9248
_________________________________________________________________
max_pooling2d_13 (MaxPooling (None, 32, 149, 149)      0
_________________________________________________________________
dropout_17 (Dropout)         (None, 32, 149, 149)      0
_________________________________________________________________
conv2d_27 (Conv2D)           (None, 64, 149, 149)      18496
_________________________________________________________________
conv2d_28 (Conv2D)           (None, 64, 147, 147)      36928
_________________________________________________________________
max_pooling2d_14 (MaxPooling (None, 64, 73, 73)        0
_________________________________________________________________
dropout_18 (Dropout)         (None, 64, 73, 73)        0
_________________________________________________________________
conv2d_29 (Conv2D)           (None, 128, 73, 73)       73856
_________________________________________________________________
conv2d_30 (Conv2D)           (None, 128, 71, 71)       147584
_________________________________________________________________
max_pooling2d_15 (MaxPooling (None, 128, 35, 35)       0
_________________________________________________________________
dropout_19 (Dropout)         (None, 128, 35, 35)       0
_________________________________________________________________
flatten_5 (Flatten)          (None, 156800)            0
_________________________________________________________________
dense_9 (Dense)              (None, 512)               80282112
_________________________________________________________________
batch_normalization_10 (Batc (None, 512)               2048
_________________________________________________________________
dropout_20 (Dropout)         (None, 512)               0
_________________________________________________________________
dense_10 (Dense)             (None, 1)                 513
=================================================================
Total params: 80,572,881
Trainable params: 80,571,257
Non-trainable params: 1,624
_________________________________________________________________
>>>
```

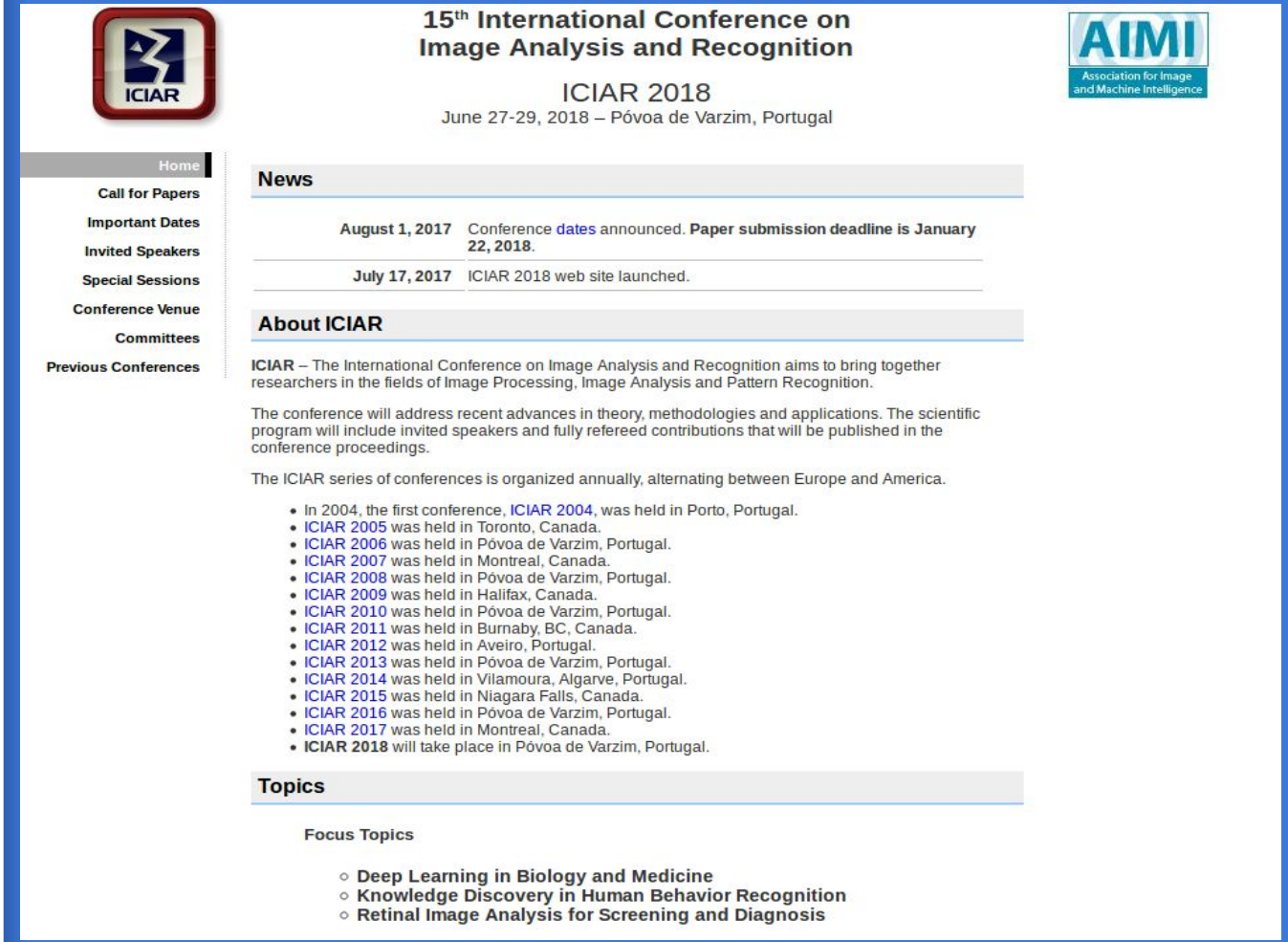
Expectativas

- Resultado do Modelo preliminar



Expectativas

- ICIAR - 2018



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August 1, 2017	Conference dates announced. **Paper submission deadline is January 22, 2018.**
July 17, 2017	ICIAR 2018 web site launched.

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ICIAR – The International Conference on Image Analysis and Recognition aims to bring together researchers in the fields of Image Processing, Image Analysis and Pattern Recognition.

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- ICIAR 2009 was held in Halifax, Canada.
- ICIAR 2010 was held in Póvoa de Varzim, Portugal.
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Topics

Focus Topics

- **Deep Learning in Biology and Medicine**
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Expectativas

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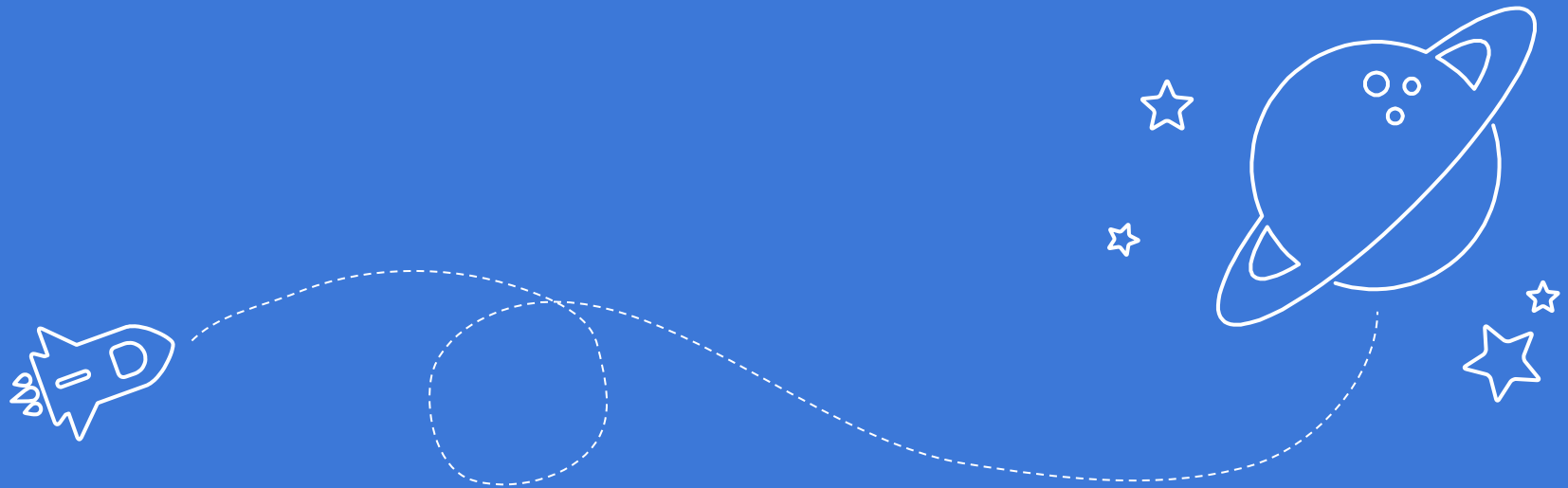
Neural networks and fuzzy systems	Multimedia signal processing
Data mining	Multimedia communications
Evolutionary and genetic algorithms	Multimedia human-machine interface and interaction



Obrigado!